

## Appendix A

### Housing Units, Households and Population Estimate and Forecast Methodology

#### Housing Units Estimates

The real estate tax assessment files as of January 1 of the current year provide the foundation from which the current counts of housing units are estimated. In addition to the number of units located on a property, housing attributes, such as the type of unit, age of the structure, percent complete, condition of the structure, assessed value, sales value, existing land use and zoning, and access to utilities, are obtained from the real estate tax assessment files for each property. Because only habitable housing units are included, certain conditions must be met in order for a housing unit to be included in the current inventory.

These conditions include the following:

- Existing land use designates that the property contains a housing unit with residential use.
- Number of housing units on a property is consistent with existing land use.
- Sufficient assessed value to indicate an adequate structure on the property.
- Housing unit is hooked up to utilities (water, sewer, gas, electric) and/or access to well and/or septic tank.
- Building permits and inspections data are used to help determine completeness of construction of housing units.

In some cases, a property has an existing land use designation of vacant land with a dilapidated residential structure. Many of these housing units are old structures in very poor condition but some are still used. The checks used to determine if a dilapidated structure is a habitable housing unit are the owner's mailing address is the same as the property address and/or the housing unit is hooked up to utilities (water, sewer, electric, gas). Units meeting these criteria are brought into the current inventory. There are very few housing units in this category.

Based on the current land use, housing units are assigned into eight categories. There are two categories of **single family detached units** (single-family and mobile home), three categories of **single-family attached units**

(duplexes, townhouses and multiplexes), and three categories of **multifamily units** which are grouped by the number of stories. The units in 1 to 4 stories are usually considered garden style or low-rise structures, 5 to 8 stories are mid-rise structures, and stories of 9 and above are high-rise structures.

Currently, housing units located on Fort Belvoir are not included in the county's inventory of housing units.

### **Households Estimates**

Current households estimates are derived for January 1 of each year. A household is an occupied housing unit. It includes all the people who occupy that unit as their usual place of residence. The information used to determine housing occupancy rates by housing type and geography comes from water utility accounts serving Fairfax County residents, U.S. Census Bureau survey data and Fairfax County surveys of rental housing complexes. Water consumption and sewer usage is analyzed using water accounts information for housing units with individual meters. Occupancy is determined when water/sewer consumption is above a certain level – where there is very low, zero consumption or no utilities connected, the unit is deemed vacant. The occupancy rates are applied and calculated based on unit type and sub-geographies of the county. For homes that use both septic tanks and well water, occupancy rates cannot be determined using the data from water utility accounts. These housing units are assumed to have the same occupancy rates as other similar units within the same geographical area.

Many multifamily housing structures do not have units with individual water/sewer meters. The occupancy rates for these multifamily units are derived from the annual Fairfax County surveys of rental housing complexes containing five or more units. These surveys include information for both privately owned rental complexes and subsidized rental complexes. The occupancy rates derived from the rental complexes are applied to unmetered rental and non-rental multifamily units by sub-geographies of the county. Occupancy data from U.S. Census Bureau survey results for Fairfax County are analyzed and compared to the occupancy rates derived from the water accounts and rental housing complexes to help validate the resulting occupancy rate assumptions.

### **Population Estimates**

Total population estimates are derived for January 1 of each year. The total population estimate is a combination of household population (persons living in housing units) and group quarters population. Household population

estimates are developed by applying household size factors and variances to occupied housing units (households). Household sizes differ by the type of housing unit and where the housing unit is located. The household size assumptions are based on the most recent U.S. Census Bureau survey data. Historical and current data and their variances are analyzed to discern developing patterns and trends. Shifts in types of housing units and racial and ethnic compositions will affect household size.

Group quarters population are those persons who reside in institutions (correctional facilities, nursing homes) and non-institutional facilities (college dormitories, military barracks and adult group homes). Group quarters population for each land parcel where these facilities are located is added to the household population to obtain the total population estimate. The group quarters populations for Fort Belvoir, Fairfax County adult and juvenile detention centers, pre-release centers, nursing homes, George Mason University dormitories, and other group facilities, are obtained directly from these institutions. Institutional and group quarters population is included in all geographies.

## **Housing Units, Household and Population Forecasting Methodology**

### **Housing Unit Forecasts**

The forecasts of housing units in Fairfax County are based on planned residential land uses and densities, vacant and underutilized residential planned land, and residential units at various stages in the process of being developed (in the “development pipeline”). Both short-term and long-term forecasts are produced, each with different methods, with long-term forecasts building upon the short-term figures. All housing unit forecasts reflect projections as of January 1 of each year.

#### **Short-Term Forecasts**

The short-term housing unit forecast horizon is five years into the future. Active residential development is the primary influence on short-term forecasts. Fairfax County’s short-term forecasting method assumes that housing units in the “development pipeline” are expected to be built before units which may be planned at some future time that are not presently in that process. Furthermore, housing units in the process of being developed are expected to be completed according to their stage within the process as of January 1 of the current report year. The general stages considered are:

- 1) units under construction;
- 2) units with building permits issued but not started;
- 3) units shown on an approved development plan;
- 4) units shown on a development plan under review;
- 5) units shown on a development plan proffered as a condition to a rezoning approval; and
- 6) units shown on a proposed development plan submitted with a rezoning application under review.

The past five years of “development pipeline” data along with assumption data on how likely and quickly housing units will be built are used to forecast short-term housing unit growth. The “development pipeline” data is analyzed and linked by parcel (location) across the records contained in the three “development pipeline” databases (ZAPS, PAWS and FIDO) to insure that housing units are not double counted or missed. The complexities in connecting the “development pipeline” data by parcel include:

- Housing units can enter the “development pipeline” at any stage – rezoning, development plan or building permit.
- Rezoning and/or development plan housing units may move to the next stage of the “development pipeline” in sections when they are part of a larger submission.
- Rezoning applications can be associated with multiple development plans and a development plan can be associated with multiple rezoning applications.
- Some housing units in the “development pipeline” may be replacement units for already existing units, thus, not adding to additional future units.

To address the complexities of tracking and linking housing units through the “development pipeline,” several decision tree methodologies are incorporated into the short-term forecasting model.

*Rezoning:* Parcel identification numbers and the rezoning application numbers are used as the primary means of tracking information through the rezoning processes. Land use and zoning district information contained in a zoning application allow a determination of housing unit type to be made. If a land parcel is involved in more than one rezoning over the past five years, only the most recent rezoning application is selected to be included in the analysis. No housing unit numbers are typically associated with proposed rezoning applications but the number of housing units associated with the rezoning is usually included in the data for an approved rezoning. For rezoning applications without housing unit numbers, an estimate is developed based on the proposed zoning and the land area associated with the application. Housing units are counted in the rezoning stage of the pipeline only if there are

no development plans associated with the rezoning. If a development plan(s) is associated with the rezoning, the number of housing units in the development plan(s) are removed from the number of housing units associated with the approved rezoning. Most linkages between rezoning applications and development plans can be made through tracking IDs in the relational databases for these two applications. The relationship between rezonings and development plans is many to many; that is, a single or multiple rezonings may be associated with one or several development plans.

*Development Plans:* Parcel identification numbers and the development plan application numbers are used as the primary means of tracking information through the development plan stage. However, parcel identification numbers associated with development plans may or may not be the same as the parcel identification numbers listed for associated rezonings or building permits. This occurs because land parcels are often consolidated and/or subdivided during the development plan stage of the “development pipeline” process. The development plan status information is used to assign whether the plan is submitted or approved and land use and zoning information is used to assign housing unit type. Housing units are counted in the development plan stage only if there are no building permits associated with the parcels in the development plan. If building permits are associated with the development plan, those housing units are assumed to have moved to the next stage of the “development pipeline” and are no longer reflected in the development plan stage. Unfortunately, connecting building permits to development plans is not always a straightforward process because sometimes the parcel identification numbers reflected in the development plans are different than those associated with the permits. To make the association between development plans and building permits, historical parcel information tracking parent-child relationships and spatial location information are used. The relationship between development plans and building permits are one to many.

*Building Permits:* Parcel identification numbers and building permit application numbers are used as the primary fields for tracking housing units through the building permit stage. The permit application number is used to link building permits to its inspections. The parcel identification number associated with a building permit may or may not be a current parcel identification number and may or may not match the parcel identification numbers in the associated development plan. This makes linking development plans and building permits difficult. Therefore if a link is not found between a building permit and a development plan, historical parcel identification numbers linked by parent-child relationships are used to find associations. Housing units in the building permit stage of development also are checked against housing units in the current inventory to determine if the units are already captured in the

current inventory. This occurs when the housing units under construction are replacement units or are complete enough to already be captured in the current inventory (80 percent complete). A housing unit in the building permit stage is considered “under construction” if any inspections are associated with the building permit.

*Likelihood of Development Assumptions:* Not every prospective housing unit in the “development pipeline” will be built and actually become a housing unit. Thus, assumptions are made about the likelihood of housing units in each development stage becoming future housing units. These likelihood assumptions are developed using statistical analyses of the historical proportions of “development pipeline” housing units that are eventually built.

*Timing of Development Assumptions:* Housing units in the “development pipeline” may take less than a year to more than 10 years to be completed. Therefore, assumptions about how quickly housing units will progress through the “development pipeline” are made. These timing assumptions are based on statistical analyses that track how quickly housing units move to completion from each stage of the “development pipeline.” The statistical analyses provide average lengths of time, medians and deciles.

## **Long-Term Forecasts**

The long-term housing unit forecast horizon is beyond five years in the future. Several types of assumptions are developed to produce long-term housing unit forecasts – planned land capacity assumptions, density range assumptions, site characteristics assumptions, and timing of development assumptions. The long-range housing unit forecasts are developed for a 30 year forecast period. For each land parcel, three housing unit forecast scenarios are produced – low, most likely and high forecasts. These scenarios are based on the range of density allowed in the Comprehensive Plan, the proximity of the property to business and transportation hubs or other features, and parcel characteristics that would make it more or less attractive for development. Only the most likely forecast scenarios are published in the annual *Demographic Reports*.

*Planned Land Capacity Assumptions:* After units in the development process are forecast to be completed, areas either reach buildout (no additional capacity exists for residential development according to planned land uses and exercising of plan option densities in the currently adopted Comprehensive Plan) or have additional capacity for residential development remaining on vacant or underutilized land. Land parcels located in plan option areas are treated differently than land parcels not contained in plan option areas. The additional capacity of land parcels not

contained in plan option areas are analyzed individually. The additional capacity of land parcels contained in plan option areas are analyzed as a group across all parcels comprising the plan option area.

*Density Range Assumptions:* Unlike the other long-range forecast assumption categories, the density range assumptions only affect the most likely forecast scenarios and do not apply to parcels contained in plan option areas. Planned land uses associated with parcels provide a density range (i.e. 5 to 8 housing units per acre) rather than a specific density. Thus for the most likely forecast scenario, assumptions must be made about whether the parcel will be developed at the low, mid or high end of the planned land use density. These density range assumptions are developed by analyzing the proximity of the parcel to factors such as business and transportation hubs, sensitive watersheds, and sewers. Parcels near business and transportation hubs are most likely to be developed at the high end of the planned land use density; parcels in watersheds and that lack access to sewers are most likely to be developed at the low end of the planned land use density; whereas, other parcels are likely be developed at the middle of the planned land use density range.

*Site Characteristics Assumptions:* Site specific characteristics are used to modify the likelihood and capacity of development as indicated by the Comprehensive Plan and its options. The site characteristics considered include recent sales of vacant property; recent development activity; age of existing structures; resource protection areas; tax exempt status; small additional potential; and buildability factors such as flood plains, steepness of slope, accessibility, and lack of sewers on land that does not percolate. Within the model, separate and unique assumptions can be developed for each of these site factors.

*Timing of Development Assumptions:* Long-range forecast 'timing of development assumptions' are based on past trends and housing absorption rates. In addition, external events such as economic growth cycles are taken into account when developing these long-range 'timing of development assumptions.' Different 'timing of development assumptions' are applied to land parcels based on the site characteristics of the parcel.

### **Household Forecasts**

Households are occupied housing units. Thus, household forecasts are derived from the housing unit forecasts and reflect projections as of January 1 of each year. Forecast households are calculated as the forecast number of housing units by type multiplied by a forecast occupancy rate. Occupancy rates are derived as the inverse of

housing vacancy rates (i.e. occupancy rate = 1 – vacancy rate). Vacancy/occupancy rates are applied based on estimates by housing type and geographical area.

*Vacancy and Occupancy Rate Assumptions:* Current vacancy rate assumptions are developed using information from several sources. Estimated vacancy rates by housing type and geography are derived using data from the U.S. Census Bureau's American Community Surveys, survey data collected on the county's rental housing complexes, and an analysis of inactive water accounts. In the forecast years, vacancy/occupancy rates by type of housing unit are assumed to remain constant in Fairfax County. This is based on past trends in vacancy/occupancy rates, which have remained stable by housing unit type for the last 20 years. However as multifamily housing becomes a larger proportion of the total housing stock in the future, overall vacancy rates are expected to trend higher because multifamily housing typically has higher vacancy rates than single family detached and attached housing.

### **Population Forecasts**

Total population is the sum of two components – household population and group quarters population. Two different methodologies are used to estimate and forecast household population and group quarters population. Household population is comprised of those persons who live in housing units. Group quarters population are those persons who live in institutions such as nursing homes, dormitories, military facilities, and etc. The Fairfax County total population forecasts reflect projections as of January 1 of each year.

### **Household Population Methodology**

Household population forecasts are derived from housing unit and household forecasts by housing unit type and geographic area. Forecasts of household population are calculated using the following methodology. The forecasts of the number of housing units by type are multiplied by occupancy rates and average household sizes. Both occupancy rates and average household sizes are assigned to these housing unit counts by housing type and geographic area.

*Occupancy Rate Assumptions:* Occupancy rate assumptions are developed using information from several sources. Estimated occupancy rates by housing type and geography are derived using data from the U.S. Census Bureau's American Community Surveys, survey data collected on the county's rental housing complexes, and an analysis of



inactive water accounts. In the forecast years, occupancy rates by type of housing unit are assumed to remain constant in Fairfax County. This is based on past trends in occupancy rates, which have remained stable by housing unit type for the last 20 years. However as multifamily housing becomes a larger proportion of the total housing stock in the future, overall occupancy rates are expected to trend lower because multifamily housing typically has lower occupancy rates than single family detached and attached housing.

*Average Household Size Assumptions:* Household size assumptions are based primarily on the most recent U.S. Census Bureau data and Fairfax County surveys. Historical, current and forecast average household sizes and variances produced by the U.S. Census Bureau and Fairfax County surveys are analyzed to develop current and forecast average household sizes and variances by housing unit type and geography. The trends influencing average household sizes in Fairfax County include housing type, racial/ethnic diversity, and socioeconomic factors.

Household sizes tend to differ by the size and style of housing units. Fewer persons per unit typically live in multifamily housing than in single family detached and single family attached housing. As the mix of housing styles changes over time to include more multifamily housing, downward pressure is applied to the county's overall average household size.

Households headed by racial and ethnic minorities in Fairfax County tend to have larger average household sizes than households with White heads of household. Since 1970, these minority households have become an increasingly larger proportion of all households. This trend has exerted upward pressure on Fairfax County's overall average household size. However within each racial/ethnic group, household sizes generally have been slowly shrinking over time due to socioeconomic factors.

Socioeconomic trends that have tended to reduce average household sizes within households of all racial and ethnic groups include:

- Fewer conventional partnerships. More adults are remaining single whether or not they are parents and those who do marry often delay until they are older than past generations. In addition, better finances and fewer negative connotations have resulted in higher numbers of divorces.
- Fewer offspring. Greater economic and occupational choices for women have resulted in fewer children per family and delays in beginning families.

- More choices for older adults. Older adults have more alternatives that allow them to age independently and, thus, they are less likely to live with family as they age.

One socioeconomic trend recently has become strong enough to put noticeable upward pressure on household sizes in Fairfax County – economic stress. Economic stress often results in the doubling up of both family and nonfamily members. The primary sources of this economic stress are two-fold. This economic stress is coming from the current recession with its high unemployment and/or under-employment and is coming from the area's high housing costs (housing affordability).

### **Group Quarters Population Methodology**

Group quarters population for each geographical area is added to the household population to obtain the total population estimate. The population of special institutions, such as Fort Belvoir, Fairfax County adult and juvenile detention centers, pre-release centers, nursing homes, George Mason University dormitories, and other group facilities, are obtained directly from these institutions. Institutional and group quarters population is included in all geographies.